

CLAIMS

1. A method of treating sewage sludge to reduce the pathogen content of said sludge, the method comprising the steps of:
 - 5 (c) adding to the sludge an effective amount of a phosphorus-containing compound; and
 - (d) keeping the phosphorus-containing compound in contact with the sludge for sufficient time to reduce the amount of pathogens present in the sludge by an amount equivalent to a logarithmic reduction of 2 or more.
- 10 2. A method as claimed in claim 1 in which the log reduction of 2 or more is achieved over a 24-hour period.
3. A method as claimed in claim 1 in which the phosphorus-containing compound is kept in contact with the sludge for sufficient time to reduce the amount of pathogens present in the sludge by a log reduction of 3 or more.
- 20 4. A method as claimed in claim 3 in which the phosphorus-containing compound is kept in contact with the sludge for sufficient time to reduce the amount of pathogens present in the sludge by a log reduction of 4 or more.
- 25 5. A method as claimed in any one of the preceding claims in which the pathogens are bacteria.
- 30 6. A method as claimed in any one of the preceding claims in which the sludge has undergone anaerobic digestion prior to step (a).

7. A method as claimed in any one of the preceding claims in which the phosphorus-containing compound is a phosphonium compound.

8. A method as claimed in claim 7 in which the phosphonium
5 compound is a tetrakis(hydroxyorgano)phosphonium salt or compound of formula (I)



10 wherein:

n is the valency of X;

R' and R'', which may be the same or different, are selected from an alkyl, hydroxyalkyl, alkenyl or aryl moiety and X is an anion.

15 9. A method as claimed in claim 8 in which R' and R'' are between 1 and 20 carbon atoms in length.

10. A method as claimed in claim 8 or claim 9 in which X is selected from the group consisting of chloride, sulphate, phosphate, acetate,
20 oxalate and bromide.

11. A method as claimed in any one of claims 8 to 10 in which the phosphonium compound is tetrakis(hydroxymethyl) phosphonium sulphate.

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12. A method as claimed in any one of claims 8 to 10 in which the phosphonium compound is selected from tetrakis(hydroxymethyl) phosphonium chloride, tetrakis(hydroxymethyl)phosphonium bromide, tetrakis(hydroxymethyl)phosphonium phosphate, tetrakis (hydroxymethyl)
30 phosphonium acetate or tetrakis(hydroxymethyl)phosphonium oxalate.

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13. A method as claimed in any one of claims 1 to 6 in which the phosphorus-containing compound is an alkyl-substituted phosphine as shown in formula (II):



wherein:

each R, which may be the same or different, is selected from a alkyl, hydroxyalkyl, alkenyl or aryl moiety.

10 14. A method as claimed in any one of the preceding claims in which the amount of phosphorus-containing compound to be added to the sludge in step (a) of the method of the present invention is up to 10000mg/l.

15 15. A method as claimed in claim 14 in which the amount of phosphorus-containing compound to be added to the sludge in step (a) of the method of the present invention is 100-2500mg/l.

20 16. A method as claimed in claim 15 in which the amount of phosphorus-containing compound to be added to the sludge in step (a) of the method of the present invention is 200-1000mg/l.

25 17. A method as claimed in any one of claims 1 to 13 in which the amount of phosphorus-containing compound to be added to the sludge is expressed relative to dry solids weight and the amount to be added is up to about 30% by weight of dry solids.

18. A method as claimed in claim 17 in which the amount of phosphorus-containing compound to be added is from 0.1 to 20% by weight of dry solids.

19. A method as claimed in claim 18 in which the amount of phosphorus-containing compound to be added is from 0.1 to 10% by weight of dry solids.

5 20. A method as claimed in claim 17 in which the amount of phosphorus-containing compound to be added is from 0.2 to 5% by weight of dry solids.

21. A method as claimed in claim 17 in which the amount of
10 phosphorus-containing compound to be added is from 0.4 to 2% by weight of dry solids.

22. A method as claimed in any one of the preceding claims in which step (b) of the method of the present invention is carried out over a period
15 of from 1 second to 14 days.

23. A method as claimed in claim 22 in which step (b) of the method of the present invention is carried out over a period of from 6 to 24 hours.

20 24. A method as claimed in claim 22 in which step (b) of the method of the present invention may be carried out over a period of from 15 seconds to 24 hours.

25. A method as claimed in any one claims 1 to 4 and claims 6 to 24 in
25 which the pathogens present in the sludge are selected from the group consisting of bacteria, viruses, protozoans and helminths.

26. A method as claimed in claim 5 and 25 in which the bacteria are selected from the group consisting of *Escherichia coli*, *Salmonella spp.*,
30 *Shigella spp.*, *Vibrio cholerae*, *Bacillus cereus*, *Listeria monocytogenes*, *Campylobacter spp.* and *Yersinia pestis*.

27. A method as claimed in claim 25 in which the viruses are selected from the group consisting of rotaviruses, calciviruses, group F adenoviruses and astroviruses.

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28. A method as claimed in claim 25 in which the protozoans are selected from the group consisting of *Entamoeba spp.*, *Giardia spp.*, *Balantidium coli* and *Cryptosporidium spp.*

10 29. A method as claimed in claim 25 in which the helminths are selected from the group consisting of *Ascaris lumbricoides* (roundworm), *Trichuris trichiura* (whipworm), *Ancylostoma duodenale* (hookworm), *Strongyloides stercoralis* (threadworm), *Schistosoma spp.*, *Taenia saginata* (beef tapeworm), *Taenia solium* (pork tapeworm) and their eggs.

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30. A sewage sludge that has been treated according to the method as claimed in any one of claims 1 to 29.

31. A method of treating sewage sludge substantially as described
20 herein with reference to the accompanying examples and figures.

32. A treated sludge substantially as described herein with reference to the accompanying examples and figures.

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